

28. (new) A cloning and/or expression vector comprising a nucleotide sequence according to claim 26.

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new*

29. (new) A cloning and/or expression vector comprising a nucleotide sequence according to claim 27.

REMARKS

This application has been amended in a manner that is believed to place it in condition for allowance at the time of the next Official Action.

Claims 1-18 have been canceled and new claims 19-29 have been added. Support for new claims 19-29 may be found in original claims 1-18 and generally throughout the specification. Specifically, support for claims 19-29 may be found at page 7, fourth and fifth paragraphs and pages 24-26.

In the outstanding Official Action, claims 1-6, 13-15 and 17-18 were rejected under 35 USC 112, first paragraph, as allegedly being based on an insufficient written description.

The Official Action alleged that the present disclosure fails to support claims directed to fragments of SEQ ID NO: 1 that encode for a protein having α -1,4 glucanotransferase activity. However, it is believed that one skilled in the art could readily determine whether a polypeptide encoded by a fragment of SEQ ID NO: 1 has a required activity of the claimed invention. Moreover, the Examiner's attention is directed to

Example 4 in the present specification. As disclosed therein, enzyme activity can be assessed by zymograms as described by MOUILLE et al. (1996). Thus, it is respectfully submitted that the claimed invention is supported by a sufficient written description.

Claims 1-6, 13-15 and 17-18 were rejected under 35 USC 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In light of the present amendment, this rejection is respectfully traversed.

The Official Action contends that the present application would not provide sufficient guidance for one skilled in the art to obtain a plant with amylopectin enriched in starch chains containing less than 6 glucose residues in light of the alleged unpredictability of transgenesis. In imposing the rejection, the Official Action relies on two documents to support this allegation. These publications are WILLMITZER et al. and KOSSMANN et al.

According to the Official Action, WILLMITZER et al. show that transformation of a plant with an antisense of a starch branching enzyme cDNA would neither modify the amylose content, nor the total starch content. However, applicant believes that this article actually discloses a higher rate of success of

transgenesis than the Official Action contends. Reference can be made for instance to page 26, last paragraph; page 37, fourth paragraph; and page 38, second paragraph.

WILLMITZER et al. state that the failure of the antisense inhibition of the starch branching enzyme is due to the existence of another isoform of this enzyme. This conclusion is supported by the fact that residual starch branching enzyme activity could be observed despite antisense inhibition (page 38, fifth paragraph). Accordingly, it is believed that the Official Action cannot conclude the level of unpredictability of transgenesis from WILLMITZER et al.

The Official Action also refers to KOSSMANN et al. The Official Action contends that KOSSMANN et al. teach that the amylose content of a potato will go unaltered despite the inhibition of the starch branching enzyme.

Upon reviewing WILLMITZER et al. and KOSSMANN et al., applicant believes that the starch branching enzyme experiment referred to in both WILLMITZER et al. and KOSSMANN et al. is the same one. In fact, applicant notes that WILLMITZER et al. and KOSSMANN et al. work in the very same lab.

Thus, it is believed that KOSSMANN et al. also fails to establish that the claimed invention does not satisfy the requirements of 35 USC 112.

As further evidence of this assertion, applicant encloses a copy of three articles that provide examples of the

successful modification of starch by transgenesis (STARK et al., 1991; SHEWMAKER et al., 1992 [see page 1086, last paragraph]; and VISSER et al., 1993 [see page 67, third and fourth paragraphs]).

Accordingly, it is believed that the Official Action's contention regarding the unpredictability of engineering modified starch using transgenesis is improper and that the rejection should be withdrawn.

Applicant submits that the results disclosed in the present application give sufficient guidance to one skilled in the art to carry out the claimed method. The Examiner's attention is respectfully directed to Examples 3-5. It is believed that the examples that demonstrate the amylopectin modifying activity of α -1,4 glucanotransferase enzyme, in combination with the capacity of said enzyme to transfer glucan residues, provide a detailed disclosure of a method for producing a transgenic plant.

Thus, in view of the above, it is believed that claims 19-29 are supported by an enabling disclosure.

In the outstanding Official Action, claims 1-6, 13-15 and 17-18 were rejected under 35 USC 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is believed that this rejection has been rendered moot.

As noted above, claims 1-18 have been cancelled. It is believed to be apparent that claims 19-29 have been drafted in a manner so as to obviate the contentions of the Official Action that the claimed invention is indefinite. Applicant believes that one of ordinary skill in the art would find claims 19-29 definite.

Claim 17 was rejected under 35 USC 101 for being directed to a "use" claim. It is believed that the present amendment obviates this rejection.

Claim 17 has been cancelled and new claims 19-29 are directed to method and composition claims. Thus, it is believed that claims 19-29 satisfy the requirements of 35 USC 101.

Claims 1-6, 13-15 and 17-18 were rejected under 35 USC 102(b) as allegedly being anticipated by HUBBARD et al. This rejection is respectfully traversed.

The present invention relates to an α -1,4 glucanotransferase expression that may be increased or decreased to modify the length of distribution of starch external chains.

α -1,4 glucanotransferases, also called D-enzymes for Disproportionating enzymes, catalyze the transfer of glucan from one 1,4- α glucan molecule to another (present specification, pages 1 and 2).

In other words, D-enzymes cleave α -1,4 linkages and create new α -1,4 linkages. These enzymes are classified as EC2.4.1.25 enzymes.

HUBBARD et al. teach the use of cDNA constructs to inhibit starch branching enzymes (SBE) activity in corn and thereby modify starch structure. As explained in the present specification, SBE are $1,4\text{-}\alpha\text{-D-glucan } 6\text{-}\alpha\text{-D}(1,4\text{-}\alpha\text{-D-glucano})$ transferases (present specification, page 1, third paragraph). SBE catalyze cleavage of $\alpha\text{-}1,4$ linkages and make $\alpha\text{-}1,6$ linkage, i.e. starch branching points. They belong to an enzymatic class different from $1,4\text{-}\alpha$ glucanotransferases (EC2.4.1.18).

Accordingly, the starch branching enzymes, the activity of which HUBBARD et al. seek to inhibit, are different from the $\alpha\text{-}1,4$ glucanotransferases of the present invention and fail to show the same enzymatic activity.

Moreover, it is believed that HUBBARD et al. fail to disclose or suggest to one of ordinary skill in the art that a starch structure can be modified by increasing or decreasing $\alpha\text{-}1,4$ glucanotransferase (D-enzyme) activity.

At the time the application was filed, only starch branching enzymes were thought to be involved in starch branching and modification of chain length distribution. As reported by TAKAHA et al. (present specification, page 2), no link had been established between D-enzyme activity and starch content or composition.

Thus, the demonstration by the inventor of the present application that D-enzymes can affect chain length distribution

is clearly unexpected. Besides starch branching enzymes, D-enzymes actually comprise another class of enzymes, the expression of which can be modulated to modify starch structure.

Thus, it is respectfully submitted that HUBBARD et al. fail to anticipate or render obvious the claimed invention.

In view of the present amendment and the foregoing remarks, therefore, it is believed that this application has been placed in condition for allowance, with claims 19-29, as presented. Allowance and passage to issue on this basis is respectfully requested.

Respectfully submitted,

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